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“NURSE’S CRAMP”: MEDIAN NEUROPATHY AT FOREARM LEVEL RELATED TO TABLET DOSAGE FROM BLISTER PACKS

Jørgen Riis Jepsen^{1,2*}

¹ Consultant, Department of Occupational Medicine, Hospital of South-western Jutland, Østergade 81-83,
DK-6700 Esbjerg, Denmark.

² Associate professor, Centre of Maritime Health and Society, University of Southern Denmark, Niels Bohrs Vej 9-10,
DK-6700 Esbjerg, Denmark.

Corresponding Author:- Jørgen Riis Jepsen

E-mail: jorgen.riis.jepsen@rsyd.dk

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ABSTRACT

Calculating the number of tablets or capsules to administer to patients is one of the most common tasks that a nurse is required to make. Home care and nursing home staff may dose tablets for clients for up to two hours per day. An increasing proportion of tablets are dispensed in blister packs. Three patients with “nurse’s cramp” related to this task are presented. The patients were referred to a department of occupational medicine due to volar forearm and hand pain related to tablet-dosing from blister packs. A detailed physical examination including a neurological assessment was performed. The physical examination revealed minor pareses of median nerve-innervated muscles, mild sensory deviations in the median nerve territories and mechanical allodynia with palpation of the median nerve trunk at the proximal forearm. The physical findings are in accordance with a median nerve entrapment on forearm level. The symptoms in all three patients were relieved by nerve mobilization and reduced exposure.

INTRODUCTION

Dosage of tablets to elderly clients is a daily task for Danish home care nurses and nursing home assistants with an estimated and increasing quarter of these being dispensed in blister packs. During a year we have seen three patients with forearm and hand pain related to this task in our department. The aim of this study is to present these cases and the applied diagnostic approach and to discuss the work-relatedness, the management, and the options for prevention.

CASE PRESENTATION

Case 1

A 48-year-old nurse had worked in home care for 12 years. A recurrent task on every work day lasting one to two hours in continuity was dosage of tablet supplies for the next two weeks. An estimated number of between 250 and 400 tablets were to be expelled from blister packs. She developed increasing work-related pain at the volar aspect

of her left dominant forearm that disappeared during summer vacation but recurred and worsened on resuming work after the vacation. The constant pain was further provoked with wrist ulnar deviation, forearm pronation, finger and wrist flexion, and during and in particular following dosage of tablets from blister packs. This aggravation of pain could last for several hours. There was neither effect of non-steroid analgesic medication nor of conventional physiotherapy. However, the symptoms disappeared after changing from day to night work that required only limited handling of tablets, and after treatment with physiotherapy based on the adverse neural tension concept (Butler) [1].

Case 2

A 55-year-old nurse had worked in a community health center for 6 years. She had been dosing an increasing number of tablets from blister packs as in case



1. Twelve years previously, an occupational accident caused a strain in her shoulder as her right dominant arm was pulled forward while attempting to support a backward falling client. Since then, her sleep was disturbed due to pain when resting on the right shoulder. In addition, she developed fatigue and subjective weakness in the extremity. During the last three years, she developed a constant pain in her right thenar eminence and radial volar forearm. The pain increased during tablet dosage and writing, and still further following such tasks. Relief from work and immobilization by plaster alleviated the symptoms, which, however, recurred on resuming work. The distal arm and hand pain was further reduced following physiotherapy based on the adverse neural tension concept (Butler) [1], dosing from blister packs in several short spells during the day instead of continuously, and by using preferably the other hand. The shoulder symptoms remained at the previous level.

Case 3

A 34-year-old nursing home assistant had been working for 7 years with daily tablet dosage. As in case 1 and 2, she expelled 100 to 500 tablets from blister packs for an average of two hours every workday. Three years previously, she developed work-related pain in her right dominant thumb and radial volar forearm. The pain was particularly disturbing when the extremity was at rest after work. She experienced relief during vacation but immediate recurrence of the pain on resuming work. The symptoms largely disappeared after physiotherapy based on the adverse neural tension concept (Butler) [1] and following changed work practices. The latter consisted in preferably expelling tablets with her left asymptomatic hand directly on the table instead of expelling to a dosage box (because the former requires less precision), and cutting the metal foil of the blister packs before forcing out the tablets.

PHYSICAL EXAMINATION

Manual testing of individual upper limb muscles (Jepsen et al.) [2], assessment of sensibility (algnesia and perception of vibration with a tuning fork 256 Hz) (Jepsen et al.) [3], palpation of nerve trunks for mechanical allodynia (Jepsen et al.) [3], and provocative maneuvers revealed similar findings in all three patients:

- A slight but distinct weakness in the median nerve-innervated forearm and hand muscles (radial flexor of wrist, pronator quadratus, long flexor of thumb, deep flexor of digits II-III, superficial flexor of digits, short abductor of thumb, and opponens pollicis).
- Cutaneous hypoalgesia and reduced perception of vibratory stimulation (276 Hz) at the volar radial fingers and the first volar web.
- Intense localized nerve trunk soreness (mechanical allodynia) along the passage of the median nerve in the proximal volar forearm, in particular between the two

heads of the pronator teres muscle and below the arcade of the superficial flexor of digits muscle.

- Pain aggravation with passive forearm supination and wrist extension, and with active flexion of the metacarpeo-phalangeal and proximal interphalangeal joint of the third finger.

In case 2, the physical examination further indicated a cervical root-affection (positive foraminal compression test with pain radiation to the right shoulder) and an infraclavicular affection of the lateral brachial plexus (localized soreness, slight motor and sensory deficiencies involving the axillary, musculocutaneous, and radial nerve over a longer course (Jepsen et al.) [3]).

In case 3, an additional slight weakness of the common extensor of the digits and of the extensor carpi ulnaris muscles, and minor mechanical allodynia of the posterior interosseous nerve on its course behind the supinator muscle (Arcade of Frohse) indicated the presence a mild nerve-affliction (radial tunnel syndrome) at this location.

DISCUSSION

The symptoms and physical findings were uniform and indicated in all three patients a median nerve entrapment at forearm level. The relation to tablet-dosing from blister packs suggests a new work-related disorder "nurse's cramp". The referral of three patients over a six months period in a hospital department of occupational medicine serving a population of 250.000 suggests that this condition may be quite common in exposed risk groups.

All patients experienced considerable discomfort for more than a year. While the previously involved physicians all perceived the conditions as tenosynovitis, the provided treatment that aimed to address this condition (non-steroid anti-inflammatory medication) had no effect. In spite of persisting symptoms the physical examination in our department showed no signs of inflammation in tendons or tendon sheaths, and could not identify any other soft-tissue disorder.

All three patients were aware of several colleagues with similar but less prominent symptoms related to blister pack tablet dosage.

The diagnosis

The diagnosis of median nerve entrapment at forearm level is based on the history and specific physical findings. Electrophysiological assessment is of little help for the diagnosis of proximal median neuropathy, and nerve conduction velocity is generally within normal range (Lundborg, Olechnik et al.) [4,5]. Work-related nerve entrapments rarely cause paralysis, but rather slight selective pareses in muscles innervated distally to the entrapped nerve segment. This can be demonstrated by manual testing of the isometric strength (Jepsen et al, Kendall et al., The Nerve Injuries Committee of the Medical Research Council) [2,6,7] with comparison of the



strength in each muscle to that of the contralateral and usually healthy extremity, or to the expected strength.

Entrapment of the median nerve may occur at the bicipital aponeurosis, pronator teres muscle and flexor digitorum superficialis arcade. With each of these locations, the pain may be provoked or aggravated with isometric elbow flexion, forearm pronation, and flexion in the two proximal joints of the third finger, respectively (Spinner) [8].

The neurological findings and the painful response to provocative maneuvers in the presented cases suggest the entrapped segments nerve-segments to be located at the pronator and superficialis levels.

Except the precedent traumatic shoulder lesion in case 2, no prior or concurrent vulnerability could be identified. In this case, proximal lesions at root and plexus level may have caused increased distal vulnerability (Upton & McComas, Mackinnon & Dellon) [9,10]. In case 3, the additional posterior interosseous nerve involvement may be due to compression by the supinator muscle (Arcade of Frohse), which is tightened during pronation.

Symptoms and physical findings similar to those in the three presented cases have been described in the literature (Lundborg, Mackinnon & Dellon, Feldman et al.) [4,10,11] after comparable exposures (Mackinnon & Dellon, Mackinnon & Novak) [10,12]. However, median-nerve entrapment at forearm level is rarely diagnosed by clinicians and may rather be interpreted as a carpal tunnel syndrome if not specifically looked for.

Exposure - pathophysiology - etiology

Dosage from blister packs requires a bilateral pinch grip and almost maximal pronation and wrist ulnar deviation. In this posture, the dominant flexed thumb applies pressure on the transparent plastic and the flexed index applies an opposed pressure against the metal foil. The metal foil breaks with the simultaneous further forearm pronation and wrist ulnar deviation while the precise falling of the tablet into the dosing box is visualized.

Active pronation, flexion of the first and second finger, and wrist ulnar deviation tend to tether the two heads of pronator teres muscle and the tendinous arcade of the superficial flexor of the digits muscle around the median nerve. Such mechanical affliction may compromise the vascular supply and function of the nerve. In spite of components of monotony and repetition, tablet dosing from blister packs appears to be an easy task compared to other well known strenuous physical exposures in nursing. However, this combination of movements and unnatural

posture may well represent a relevant pathophysiological mechanism.

Work-related median nerve-entrapment at forearm level seems to be common (Lundborg, Feldman et al.) [4,11]. This is supported by a study revealing a high prevalence among female Swedish milkers (Stål et al.) [13], the work of whom may also not appear particularly strenuous. There are no epidemiologic studies of causation of median nerve compression of the forearm.

Treatment and prevention

A rational treatment strategy would be to mobilize the compressed nerve segment (Butler) [1] and to stretch the presumed shortened pronator teres muscle in order to increase the available space around the nerve, so that the nerve can be mobilized and its circulation improved. The muscular balance can be reestablished by strengthening weak antagonists. The extremity may be kept in a supinated position during rest (Novak & Mackinnon) [14] – possibly with plaster. With failure of conservative treatment, surgical decompression of the nerve may be considered (Olechnik et al.) [5].

Potential preventive interventions include a reduced exposure by combining various minor modifications each aiming to diminish the harmful impact on tissues. When dosage of tablets from blister packs is necessary, the nurse may distribute this task over several short periods and expel tablets to a tray instead of directly to the dosing box. Blister packs may be manufactured for easy breakage by use of thinner metal foil or with pre-cut scratches.

The prescription of medicine for institutional use would favor from substitution with synonym drugs dispensed in glass containers. The ultimate solution would be instrumental unit dosing from blister packs directly to perforated plastic strips or individual packets for clients with each unit containing the tablets to be taken at a specific time. This technology, which can be managed by the pharmacy, is being increasingly applied and may eventually prevent “nurse’s cramp”.

CONCLUSION

The three presented cases represent the first publication of median nerve entrapment – “nurse’s cramp” – at forearm level in nurses exposed to dosage of blister pack tablets.

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CONFLICT OF INTEREST: NIL

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